This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS

- TEXT CUT OFF AT TOP, BOTTOM OR SIDES

- FADED TEXT

- ILLEGIBLE TEXT

- SKEWED/SLANTED IMAGES

- COLORED PHOTOS

- BLACK OR VERY BLACK AND WHITE DARK PHOTOS

- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

(12) **UK Patent Application** (19) **GB** (11) **2 297 663** (13) **A**

(21) Application No 9502167.1

(22) Date of Filing 03.02.1995

(71) Applicant(s)
The General Electric Company p l c

(Incorporated in the United Kingdom)

1 Stanhope Gate, LONDON, W1A 1EH,
United Kingdom

(72) Inventor(s)
Alan John Jones
David Nicholas Scahill

(74) Agent and/or Address for Service
GEC Patent Department
Waterhouse Lane, CHELMSFORD, Essex, CM1 2QX,
United Kingdom

(51) INT CL^6
H04M 11/00

(52) UK CL (Edition O)
H4K KOC

(56) Documents Cited
GB 2279210 A   EP ˜527072 A2
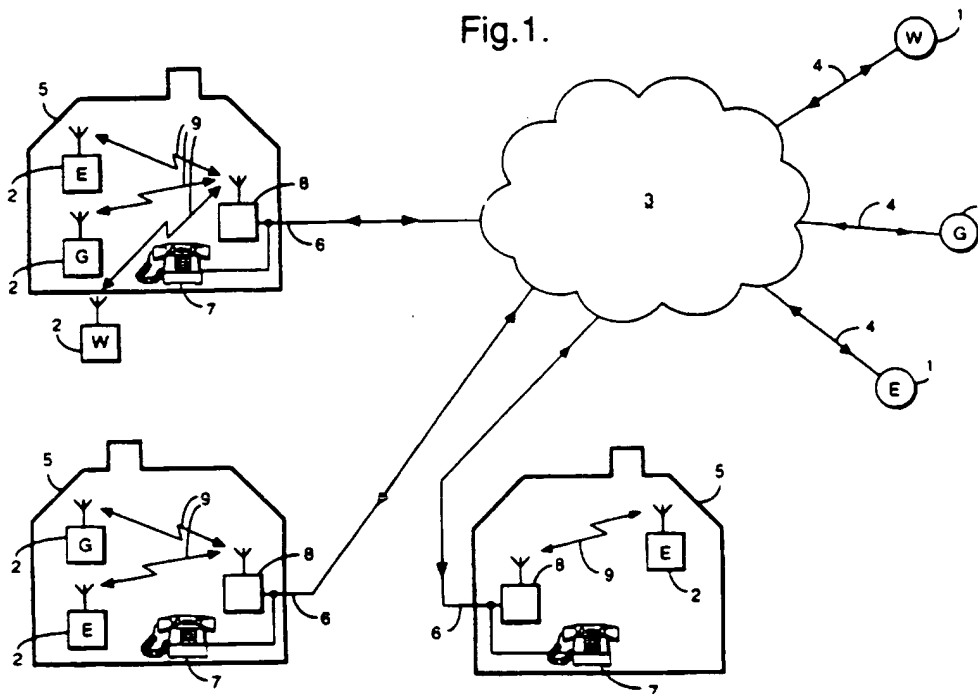
(58) Field of Search
UK CL (Edition N) H4K KOC
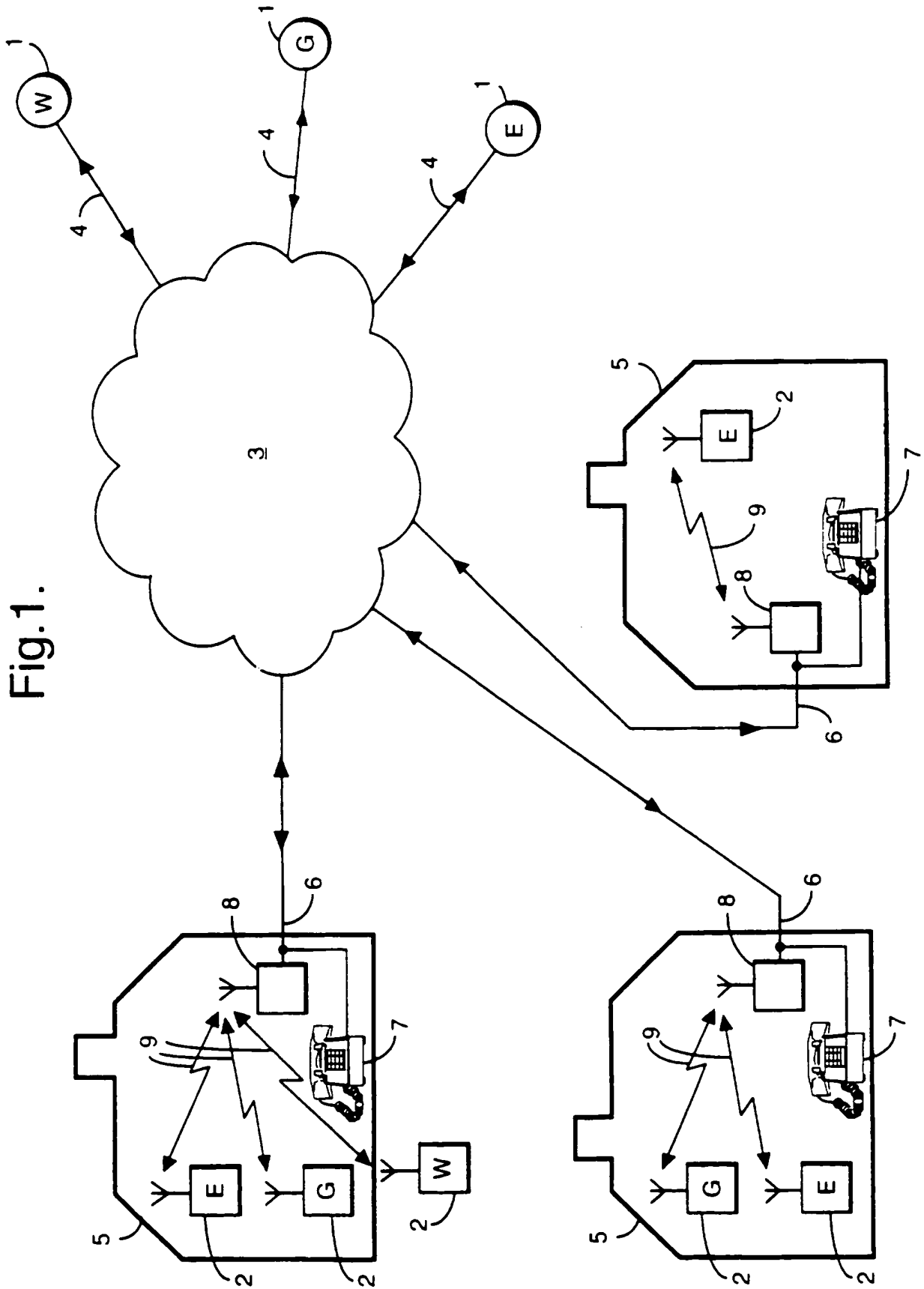INT CL^6 H04M
Online: WPI

(54) **Remote meter reading**

(57) A system for remote reading of utility consumption registering meters comprises a data collection point (1) connected with a telecommunications network (3); a respective link (6) to the telecommunications network for each of a plurality of utility consumers (5); a respective meter reading unit (8) connected to the consumer's end of each said link and which includes a first radio transceiver (16); and at least one utility consumption meter (2) which includes a second transceiver (17) arranged for radio communication with the transceiver of the meter reading unit, whereby consumption data may be sent from the meter via the radio link (9) between the first and second radio transceivers and the telecommunications network to the data collection point.

Fig.1.

GB 2 297 663 A

Fig.1.

REMOTE METER READING

The present invention relates to a system for remote reading of utility consumption registering meters.

With the privatisation of many of the companies providing metered utilities, for example
5   electricity, water and gas, and the resultant need to improve efficiency, remote meter reading is becoming increasingly attractive. Despite continued efforts to install utility consumption registering meters in areas of public access, many thousands of meters still remain behind locked doors. It is not always possible for utility consumers to be present when the utility supplier wishes to make a meter reading. Inaccessibility is therefore a
10   source of annoyance both for the utility supplier and consumer alike. Remote reading, which does not require access to the consumer's premises, is therefore advantageous in these circumstances.

Many systems for remote reading of utility consumption meters, particularly electricity
15   consumption meters, have been proposed. One system of remotely reading electricity consumption meters is via the existing supply cabling using power line signalling. This method is attractive for two reasons: (1) by definition all consumers are connected to the supply network and are therefore connected to the communications network; and (2) the control and ownership of this network is owned by the utility supplier. Power line
20   signalling is, however, expensive due to the complexity of the circuitry required.

For the suppliers of utilities other than electricity, systems that utilise existing
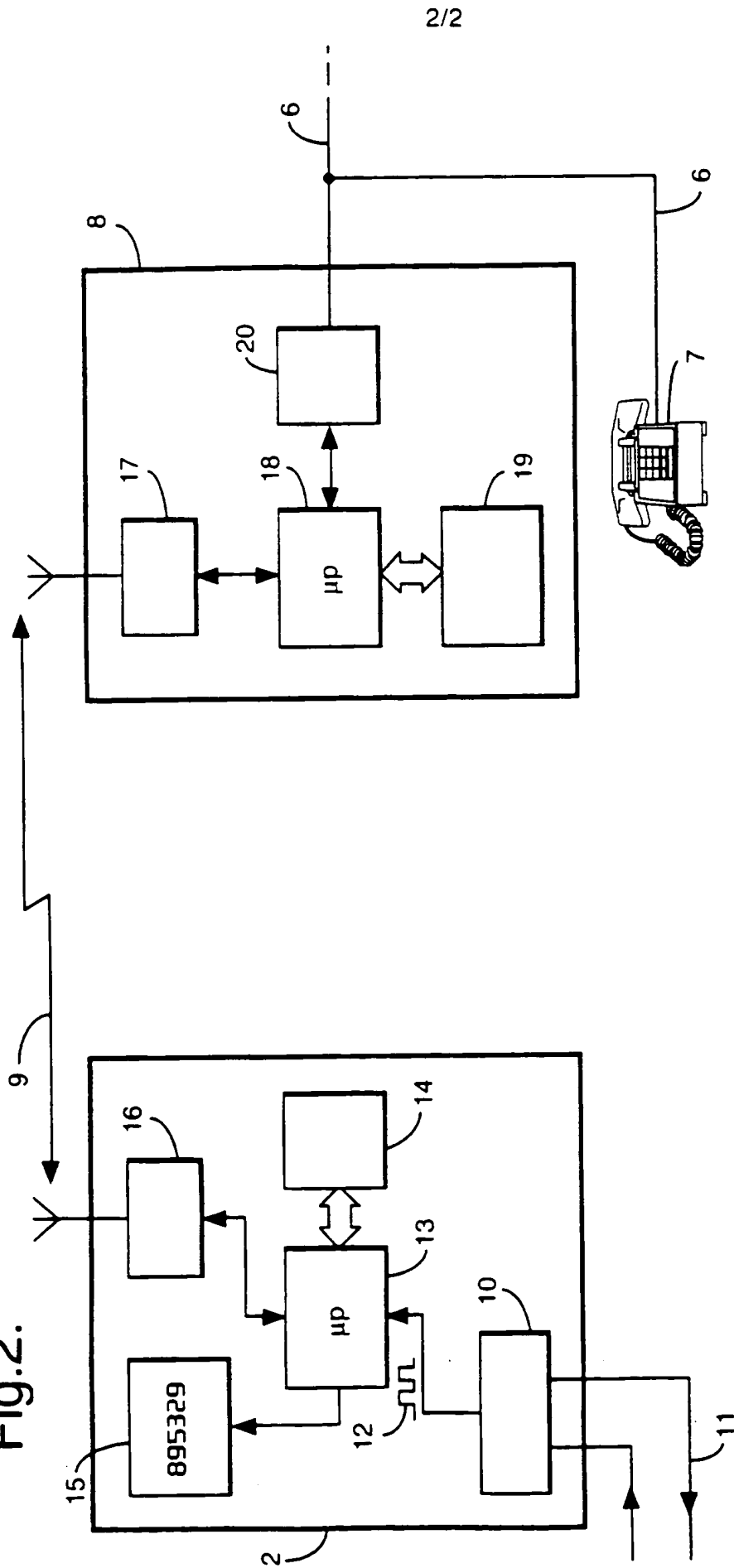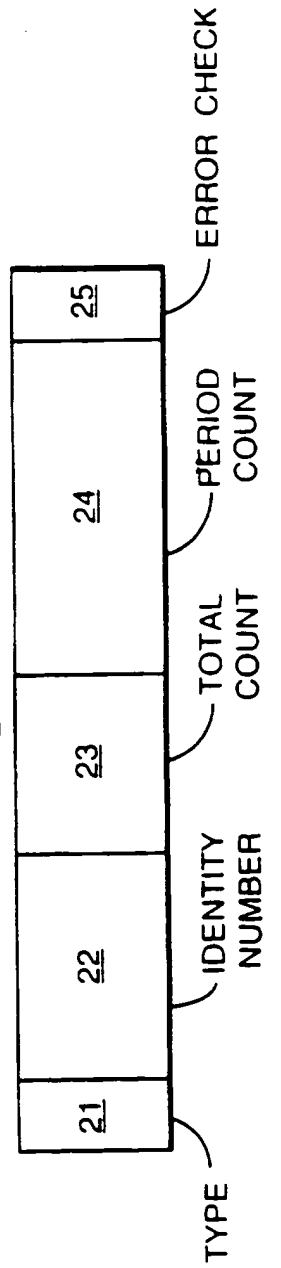
Fig.2.

Fig.3.

TYPE	IDENTITY NUMBER		TOTAL COUNT	PERIOD COUNT	ERROR CHECK
21	22		23	24	25

communications networks or which share the network between utility suppliers are preferred. For example, radio based systems have been proposed in which a series of fixed base stations are provided to communicate with utility meters which include either a transceiver or transmitter. With a meter which includes a transceiver, two-way

5   communication is possible allowing the utility meter not only to be remotely read but also remotely programmed. Data from the fixed base stations is communicated back to regional, or central, data collection points either using further radio links or using existing telecommunications networks. Billing information is prepared from this data which is then sent to the consumer. To reduce costs, the trend has been to reduce the

10   number of base stations by making each capable of accessing as many meters as possible, typically a hundred or more, the limit being determined by the maximum operating power of the meter radio transmitter/transceiver. It has also been proposed to use mobile base stations, which travel from one geographical area to another collecting data from a large number of meters. A disadvantage of these radio based

15   systems is finding an available frequency amongst the already crowded airwaves and the costs of the licence necessary to operate on such frequencies. A need exists therefore for a remote utility meter reading system that overcomes some of the aforementioned problems.

20   According to the present invention there is provided a system for remote reading of utility consumption registering meters comprising: a data collection point connected with a telecommunications network; a respective link to the telecommunications network for each of a plurality of utility consumers; a respective meter reading unit connected to the consumer's end of each said link and which includes a first radio transceiver; and at least

one utility consumption meter which includes a second transceiver arranged for radio communication with the transceiver of the meter reading unit, whereby consumption data may be sent from the meter via the radio link between the first and second radio transceivers and the telecommunications network to the data collection point. By

5   employing the present invention it is possible to use low power radio transceivers which do not require a licence to operate. Such transceivers could, for example, have an operating range of approximately one hundred metres.

It is preferred that the meter reading unit is arranged to communicate with consumption

10   meters on the same premises.

One system in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

15   Figure 1 is a schematic representation of the system;

Figure 2 is a block diagram of a utility consumption meter and meter reading unit of the system; and

20   Figure 3 is a representation of the transmitted data format used in the system.

Referring to Figure 1, the system has a plurality of data collection points 1 for collecting meter reading data from a plurality of utility consumption registering meters 2. Three data collection points are shown, in which each corresponds to a respective utility -

water, gas or electricity - as indicated by the reference letters W, G and E in the Figure. Each data collection point 1 is connected to a telecommunications network 3 by means of a suitable connection 4.

5   Each utility consumer 5 has a telephone line 6, or suitable transmission line link, which connects the consumer's telephone 7, or other equipment such as facsimile machines, to the telecommunications network 3. Also connected to the consumer's telephone line 6 is a meter reading unit 8 for remotely reading the consumer's utility consumption registering meters 2. The meter reading unit 8 communicates with the consumer's

10   consumption meters 2 by means of low power radio links 9 and is capable of addressing up to a maximum of ten consumption meters 2. The consumer's consumption meters 2 may be located either in the consumer's premises 5 or in close proximity thereto, as for example in the case of a water consumption meter 2.

15   Referring to Figure 2, a utility consumption meter 2 is shown and comprises a sensor 10, processor 13, memory 14, display means 15 and a low power transceiver circuit 16. The sensor 10 detects consumption of a utility 11 and produces a pulse 12 for each unit of the utility 11 consumed. The processor 13 is arranged to count these pulses and determine the total number of units of the utility 11 consumed since the meter was commissioned

20   and the number of units consumed in a selected period; the selected period being set by the utility supplier. These consumption data, that is total and selected period counts, are stored in a memory 14. The display means 15 is provided for displaying information to the consumer such as for example the total number of units consumed, the time and date, whether the current tariff is at high or low rate etc. The processor 13 also controls

a low power transceiv ... hich is capable of two-way radio communication with a second low pow. ... eiver circuit 17 in the meter reading unit 8.

The low power radio transceiver 17, which are multi-channel circuits, are capable of operating on a range of freque... ...

Each meter reading unit 8 a... ... ...ises a microprocessor 18, a memory 19 and an interface 20 as shown in F ... the interface 20 provides matching between the consumer's telephone line ... ...eter reading unit 8 and could, for example in the case of an analogue telephot... ... comprise a modem. With the introduction of the Integrated Services Digital N... (ISDN) in the near future, which brings access to digital communication to the cons... ...r level, the interface 20 could comprise a suitable ISDN digital interface.

In operation of the system, the m... ...rocessor 13 is configured to periodically convey the total number of units of uti... consumed and the selected period count to the associated meter reading unit 8. ...data is stored in the meter reading unit's memory 19 together with consumption data ...m other utility meters. With each meter reading unit 8 storing consumption data ... ...to ten utility consumption meters 2, it is preferred that each meter 2 has its own u... ...identity number which is transmitted with the consumption data. The meter ... ...ing unit's microprocessor 18 is programmed to convey this data, at pre-set interval... ...r at a specific time, to the respective data collection point 1 by means of the telecomm...nications network 3.

Preferably the m... such that communic... network can be made without affecting ...tion of the consumer's ... for example using a "non-ring" service ... voice communication or oth... technique. So that the consumer is not ch... ...r the meter reading proce... ...cation preferably uses a "Freefone" ...mb... other such free service.

In an alternative ...gement the data collection ... interrogate the meter reading units by ca... ...spective meter read... ...call preferably being made at a time wh... ... v to cause annoyance ... ...er using a "non-ring" service. In the sy... ...strated full duplex comm... ...ossible between the meter reading un... a... utility consumption m... ...dition, therefore, to conveying consu... ...ta to the data collection p... ...and/or meter reading unit can be upda... ...ogrammed by the utility ... ...information such as current tariff rate... ...ngeover times between l... ...ff rates, the selected period for loggin... ...ption, etc.

The data forma... ...smitting data from the m... ...er reading unit 8 is shown in Figu... ...ing to Figure 3, the data f... ...five data fields. The first, 21, is a ty... ...r field and indicates th... ...meter, for example whether it is a ... ...or electricity and wh... ...ayment meter. The second data fie... ...address field which is fo... ...gth and includes the unique identity ... ...the meter. The third d... ...ich is three bytes in length, correspon... ...al number of units co... ...ourth data field, 24, represents five ... ...nsumption readings f... ...ve selected charge

periods. Finally, the fifth field, 25, is provided for error checking purposes such as parity checking.

For billing purposes, each utility consumption meter 2 must be associated with (1) a particular respective meter reading unit 8 and (2) with a particular consumer and account number. Preferably the association of the meter 2 and meter reading unit 8 is established automatically upon installation of the utility meter 2. To this end the utility meter's processor 13 is configured such that upon installation of the meter, the meter's transceiver 16 listens for an encoded signal on a given channel which is periodically transmitted by the meter reading unit 8. Upon detecting this encoded signal, the meter 2 transmits, on the same channel, its unique identity number and a flag indicating that it is not currently associated with a meter reading unit 8. Provided the meter reading unit 8 is not already associated with the maximum allowable number of meters 2 it will acknowledge the transmission from the newly installed meter 2.

Following installation and association with a meter reading unit 8, the meter's unique identity number needs to be associated with the consumer and their account number. A number of ways of doing this are possible, ranging from simple manual means to those requiring hand-held equipment used by the installer. Association of the consumer with the meter need not be established at the time of installation. One preferred method is for each meter to be provided with a detachable bar code label which includes the meter's identity number. Preferably the bar code label consists of two parts, each part carrying the same data and unique identity number. One half of the label is removed at the time of installation and taken back to the control centre, or data collection point, where the

code can be manually entered into the central computer against the consumer's name. address and account number. The part of the label remaining on the meter is provided for identifying the meter during manual meter readings which may be required periodically.

CLAIMS

1.   A system for remote reading of utility consumption registering meters comprising: a data collection point connected with a telecommunications network; a respective link to the telecommunications network for each of a plurality of utility consumers; a respective meter reading unit connected to the consumer's end of each said link and which includes a first radio transceiver; and at least one utility consumption meter which includes a second transceiver arranged for radio communication with the transceiver of the meter reading unit, whereby consumption data may be sent from the meter via the radio link between the first and second radio transceivers and the telecommunications network to the data collection point.

2.   A system according to claim 1 in which each said link comprises a respective consumer's telephone line.

3.   A system according to claim 1 or 2, in which the meter reading unit is arranged to communicate with consumption meters on the same premises.

4.   A system according to any preceding claim in which the first and second radio transceivers have a maximum operating range of substantially one hundred metres.

5.   A system according to any preceding claim in which each utility meter is configured upon installation to automatically associate itself with a particular meter reading unit.

6.   A system for remote reading of utility consumption registering meters substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
GB 9502167.1

Relevant Technical Fields

(i) UK Cl (Ed.N)   H4K; KOC

(ii) Int Cl (Ed.6)   H04M

Search Examiner
AL STRAYTON

Date of completion of Search
26 APRIL 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-
ALL

Categories of documents

X: Document indicating lack of novelty or of inventive step

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application

&:   Member of the same patent family; corresponding document

Category	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2279210 A (DRUM) page 6, lines 1-19	1-4
X	EP 0527072 A2 (SCHLUMBERGER) column 12, lines 8-23	1-4